



CONSUMER SERVICES TECHNICAL EDUCATION GROUP PRESENTS

G-22

UNDERSTANDING TECH SHEETS

⚠ WARNING
Disconnect power before servicing.
Replace all parts and panels before operating.
Failure to do so can result in death or electrical shock.

⚠ AVERTISSEMENT
Risque de choc électrique.
Déconnecter la source de courant électrique avant l'intervention.
Remplacer pièces et panneaux avant de faire la remise en marche.
À la non respect de ces instructions peut causer un décès ou un choc électrique.

Electrostatic Discharge (ESD)
Sensitive Electronics

ESD problems are present everywhere. ESD may damage or weaken the electronic board. The new board may appear to work well after repair is finished, but failure may occur at a later date due to ESD stress.

- Use an anti-static wrist strap. Connect wrist strap to ground connection point or ungrounded metal in the appliance.
- OR
- Touch your finger repeatedly to a ground connection point or ungrounded metal in the appliance.
- Before removing the part from its package, touch the anti-static bag to a ground connection point or ungrounded metal in the appliance.
- Avoid touching electronic parts or terminal contacts, handle electronic board by edges only.
- When repackaging failed electronic board in anti-static bag, observe above instructions.

Circuits électroniques sensibles aux décharges électrostatiques

Les problèmes de décharges électrostatiques sont présents partout. Ces décharges peuvent endommager ou affaiblir l'ensemble de commande électronique. Le nouvel ensemble de commande peut sembler bien fonctionner après la réparation, mais il peut se révéler défectueux par la suite, à cause de la contamination due aux décharges électrostatiques.

- Porter un bracelet antistatique. Raccorder le bracelet à la connexion de masse verte ou à une partie métallique non peinte de la machine.
- OU
- Toucher plusieurs fois du bout du doigt une connexion de masse verte ou une partie métallique non peinte de la machine.
- Avant de sortir la pièce de son emballage, agripper le sac antistatique ou une connexion de masse verte ou une partie métallique non peinte de la machine.
- Eviter de toucher les pièces électroniques ou les contacts des bornes, ne manipuler l'ensemble de commande électronique que par ses bords.
- Quand on place l'ensemble de commande électronique (électronique dans le sac antistatique), respecter les instructions ci-dessus.

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING UNITED STATES PATENTS:

4,873,441	5,200,252	5,046,750	6,305,194
4,873,442	5,200,253	5,046,751	6,305,195
4,799,227	5,169,433	5,169,434	5,274,288
4,799,228	5,169,435	5,169,436	5,274,289
4,799,229	5,169,437	5,169,438	5,274,290
4,807,223	5,169,439	5,169,440	5,274,291
5,176,899	5,169,441	5,169,442	5,274,292
5,176,900	5,169,443	5,169,444	5,274,293
5,176,901	5,169,445	5,169,446	5,274,294
5,176,902	5,169,447	5,169,448	5,274,295
5,176,903	5,169,449	5,169,450	5,274,296
5,176,904	5,169,451	5,169,452	5,274,297
5,176,905	5,169,453	5,169,454	5,274,298
5,176,906	5,169,455	5,169,456	5,274,299
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5,176,913	5,169,469	5,169,470	5,274,306
5,176,914	5,169,471	5,169,472	5,274,307
5,176,915	5,169,473	5,169,474	5,274,308
5,176,916	5,169,475	5,169,476	5,274,309
5,176,917	5,169,477	5,169,478	5,274,310
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5,176,930	5,169,503	5,169,504	5,274,323
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5,176,933	5,169,509	5,169,510	5,274,326
5,176,934	5,169,511	5,169,512	5,274,327
5,176,935	5,169,513	5,169,514	5,274,328
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5,176,959	5,169,561	5,169,562	5,274,352
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5,176,971	5,169,585	5,169,586	5,274,364
5,176,972	5,169,587	5,169,588	5,274,365
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5,176,974	5,169,591	5,169,592	5,274,367
5,176,975	5,169,593	5,169,594	5,274,368
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5,177,019	5,169,681	5,169,682	5,274,412
5,177,020	5,169,683	5,169,684	5,274,413
5,177,021	5,169,685	5,169,686	5,274,414
5,177,022	5,169,687	5,169,688	5,274,415
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5,177,024	5,169,691	5,169,692	5,274,417
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5,177,026	5,169,695	5,169,696	5,274,419
5,177,027	5,169,697	5,169,698	5,274,420
5,177,028	5,169,699	5,169,700	5,274,421
5,177,029	5,169,701	5,169,702	5,274,422
5,177,030	5,169,703	5,169,704	5,274,423
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5,177,033	5,169,709	5,169,710	5,274,426
5,177,034	5,169,711	5,169,712	5,274,427
5,177,035	5,169,713	5,169,714	5,274,428
5,177,036	5,169,715	5,169,716	5,274,429
5,177,037	5,169,717	5,169,718	5,274,430
5,177,038	5,169,719	5,169,720	5,274,431
5,177,039	5,169,721	5,169,722	5,274,432
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5,177,051	5,169,745	5,169,746	5,274,444
5,177,052	5,169,747	5,169,748	5,274,445
5,177,053	5,169,749	5,169,750	5,274,446
5,177,054	5,169,751	5,169,752	5,274,447
5,177,055	5,169,753	5,169,754	5,274,448
5,177,056	5,169,755	5,169,756	5,274,449
5,177,057	5,169,757	5,169,758	5,274,450
5,177,058	5,169,759	5,169,760	5,274,451
5,177,059	5,169,761	5,169,762	5,274,452
5,177,060	5,169,763	5,169,764	5,274,453
5,177,061	5,169,765	5,169,766	5,274,454
5,177,062	5,169,767	5,169,768	5,274,455
5,177,063	5,169,769	5,169,770	5,274,456
5,177,064	5,169,771	5,169,772	5,274,457
5,177,065	5,169,773	5,169,774	5,274,458
5,177,066	5,169,775	5,169,776	5,274,459
5,177,067	5,169,777	5,169,778	5,274,460
5,177,068	5,169,779	5,169,780	5,274,461
5,177,069	5,169,781	5,169,782	5,274,462
5,177,070	5,169,783	5,169,784	5,274,463
5,177,071	5,169,785	5,169,786	5,274,464
5,177,072	5,169,787	5,169,788	5,274,465
5,177,073	5,169,789	5,169,790	5,274,466
5,177,074	5,169,791	5,169,792	5,274,467
5,177,075	5,169,793	5,169,794	5,274,468
5,177,076	5,169,795	5,169,796	5,274,469
5,177,077	5,169,797	5,169,798	5,274,470
5,177,078	5,169,799	5,169,800	5,274,471
5,177,079	5,169,801	5,169,802	5,274,472
5,177,080	5,169,803	5,169,804	5,274,473
5,177,081	5,169,805	5,169,806	5,274,474
5,177,082	5,169,807	5,169,808	5,274,475
5,177,083	5,169,809	5,169,810	5,274,476
5,177,084	5,169,811	5,169,812	5,274,477
5,177,085	5,169,813</		

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INTRODUCTION

The goal of this Job Aid is to assist the IHSP, or IHSP trainer, in understanding the types of technical information that is contained in tech sheets.

This Job Aid will focus on the following portions of the tech sheet:

- Esterline Charts
- Logic Charts
- Wiring Diagrams
 - Components
 - Symbols
 - Tracing
- Strip Circuits
- Component Testing
- Diagnostic Charts

The exercises and questions will aid in reinforcing what has been learned.

ESTERLINE CHARTS

Chart 1

The first key to unlocking the mysteries of the Esterline chart is to understand what information is found on the chart. Some of the items on the charts are used by engineers and manufacturing.

The most important functions of the tech sheet will be covered to help the IHSP in troubleshooting.

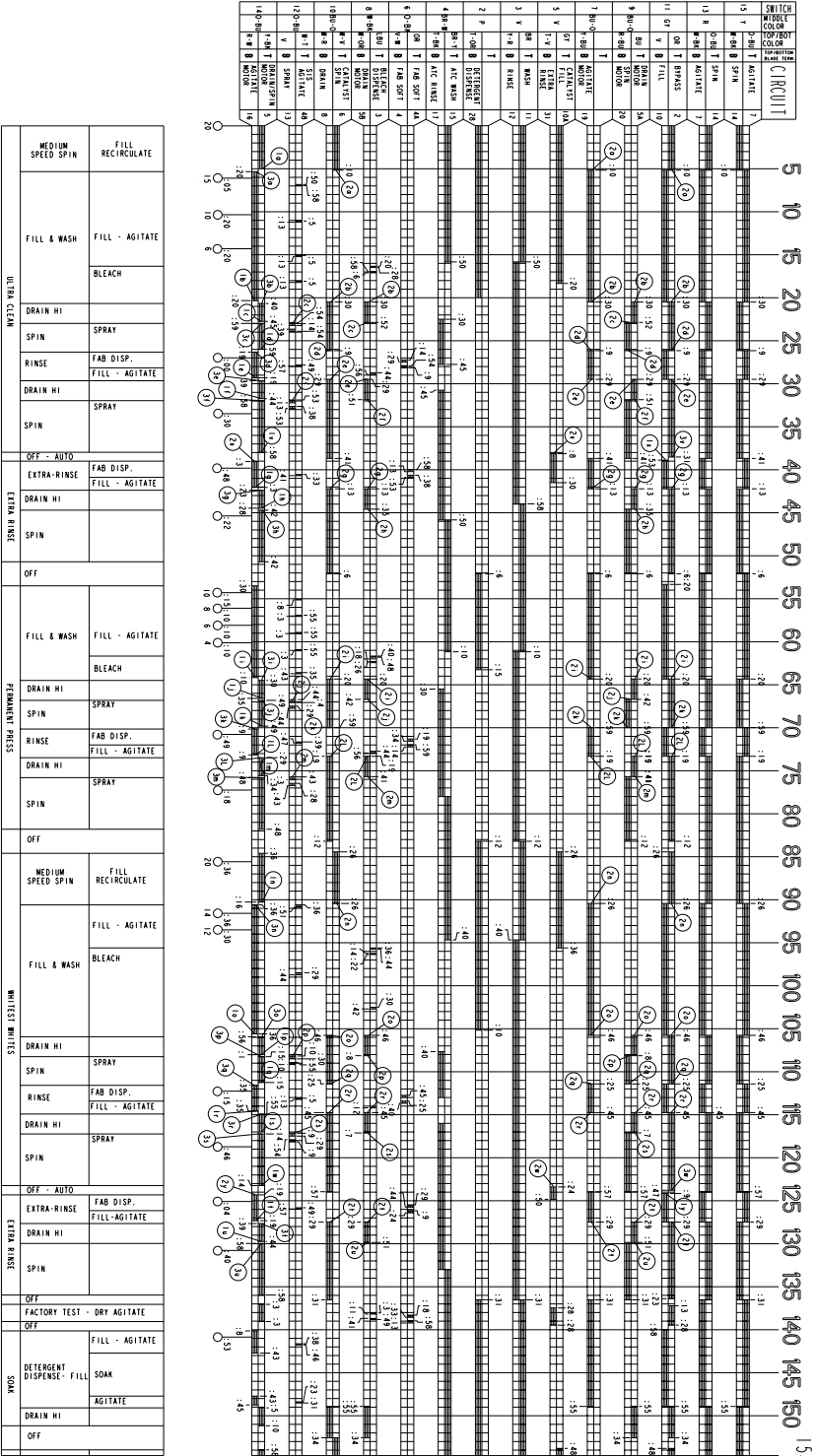


Chart 2

SWITCH	MIDDLE COLOR	TOP/BOT COLOR	TOP/BOTTOM BLADE TERM.	CIRCUIT	
15	Y	O-BU	T	AGITATE	7
		W-BK	B	SPIN	14
13	R	O-BU	T	SPIN	14
		W-BK	B	AGITATE	7
11	GY	OR	T	BYPASS	2
		V	B	FILL	10
9	BU-O	BU	T	DRAIN MOTOR	5A
		R-BU	B	SPIN MOTOR	20
7	BU-O		T		
		Y-BU	B	AGITATE MOTOR	19
5	V	GY	T	CATALYST FILL	10A
		T-V	B	EXTRA RINSE	31
3	V	BR	T	WASH	11
		Y-R	B	RINSE	12
2	P		T		
		T-OR	B	DETERGENT DISPENSE	28
4	BR-W	BR-Y	T	ATC WASH	15
		T-BK	B	ATC RINSE	17
6	O-B	OR	T	FAB SOFT	4A
		V-W	B	FAB SOFT	4
8	W-BK	LBU	T	BLEACH DISPENSE	3
		W-OR	B	DRAIN MOTOR	5B
10	BU-O	W-V	T	CATALYST SPIN	6
		W-R	B	DRAIN	8
12	O-BU	W-T	T	SIS AGITATE	48
		V	B	SPRAY	13
14	O-BU	Y-BK	T	DRAIN/SPIN MOTOR	5
		R-W	B	AGITATE MOTOR	16

Terminal Code Or Wire Color Code

Indicates the color of the wire that is connected to the timer and goes to the component that performs the function indicated.

A solid colored wire will be designated with a single or two letter code.

For example:

- V is a violet wire
- GY is a gray wire

A wire may have a specific color with a "tracer" line on the wire. These will be designated by two sets of letters divided by a dash "-".

For example:

- T - OR is a tan wire with an orange stripe.

Chart 3

SWITCH	MIDDLE COLOR	TOP/BOT COLOR	TOP/BOTTOM BLADE TERM.	CIRCUIT	
15	Y	O-BU	T	AGITATE	7
		W-BK	B	SPIN	14
13	R	O-BU	T	SPIN	14
		W-BK	B	AGITATE	7
11	GY	OR	T	BYPASS	2
		V	B	FILL	10
9	BU-O	BU	T	DRAIN MOTOR	5A
		R-BU	B	SPIN MOTOR	20
7	BU-O		T		
		Y-BU	B	AGITATE MOTOR	19
5	V	GY	T	CATALYST FILL	10A
		T-V	B	EXTRA RINSE	31
3	V	BR	T	WASH	11
		Y-R	B	RINSE	12
2	P		T		
		T-OR	B	DETERGENT DISPENSE	28
4	BR-W	BR-Y	T	ATC WASH	15
		T-BK	B	ATC RINSE	17
6	O-BK	OR	T	FAB SOFT	4A
		V-W	B	FAB SOFT	4
8	W-BK	LBU	T	BLEACH DISPENSE	3
		W-OR	B	DRAIN MOTOR	5B
10	BU-O	W-V	T	CATALYST SPIN	6
		W-R	B	DRAIN	8
12	O-BU	W-T	T	SIS AGITATE	48
		V	B	SPRAY	13
14	O-BU	Y-BK	T	DRAIN/SPIN MOTOR	5
		R-W	B	AGITATE MOTOR	16

Timer Switch Function

This column indicates the function of the timer contact (switch).

It may be written to describe the function that is performed when a particular contact is closed.

It may be used to describe the actual load that is used in conjunction with that particular timer contact.

Chart 4

SWITCH	MIDDLE COLOR	TOP/BOT COLOR	TOP/BOTTOM BLADE TERM.	CIRCUIT	
15	Y	O-BU	T	AGITATE	7
		W-BK	B	SPIN	14
13	R	O-BU	T	SPIN	14
		W-BK	B	AGITATE	7
11	GY	OR	T	BYPASS	2
		V	B	FILL	10
9	BU-O	BU	T	DRAIN MOTOR	5A
		R-BU	B	SPIN MOTOR	20
7	BU-O		T		
		Y-BU	B	AGITATE MOTOR	19
5	V	GY	T	CATALYST FILL	10A
		T-V	B	EXTRA RINSE	31
3	V	BR	T	WASH	11
		Y-R	B	RINSE	12
2	P		T		
		T-OR	B	DETERGENT DISPENSE	28
4	BR-W	BR-Y	T	ATC WASH	15
		T-BK	B	ATC RINSE	17
6	O-BK	OR	T	FAB SOFT	4A
		V-W	B	FAB SOFT	4
8	W-BK	LBU	T	BLEACH DISPENSE	3
		W-OR	B	DRAIN MOTOR	5B
10	BU-O	W-V	T	CATALYST SPIN	6
		W-R	B	DRAIN	8
12	O-BU	W-T	T	SIS AGITATE	48
		V	B	SPRAY	13
14	O-BU	Y-BK	T	DRAIN/SPIN MOTOR	5
		R-W	B	AGITATE MOTOR	16

Timer Switch Numbers

The numbers in this column indicate the timer contact. They correspond to the numbers on the wiring diagram. There is no sequence to these numbers.

Chart 5

The diagram shows **INTERVALS** 0 – 32, and is interpreted as follows:

- The intervals on this diagram are each 1 minute.
- Some diagrams may represent other increments of time (such as 90 or 120 seconds).

- Use the legend on the tech sheet to determine the timing for the unit you are servicing.
- Special timing intervals are used when a timer contact is closed or opened at a time other than the timing chart increment.
- The “:10” (outlined on the enlarged lower chart) indicates a contact that closes 10 seconds after the interval begins.

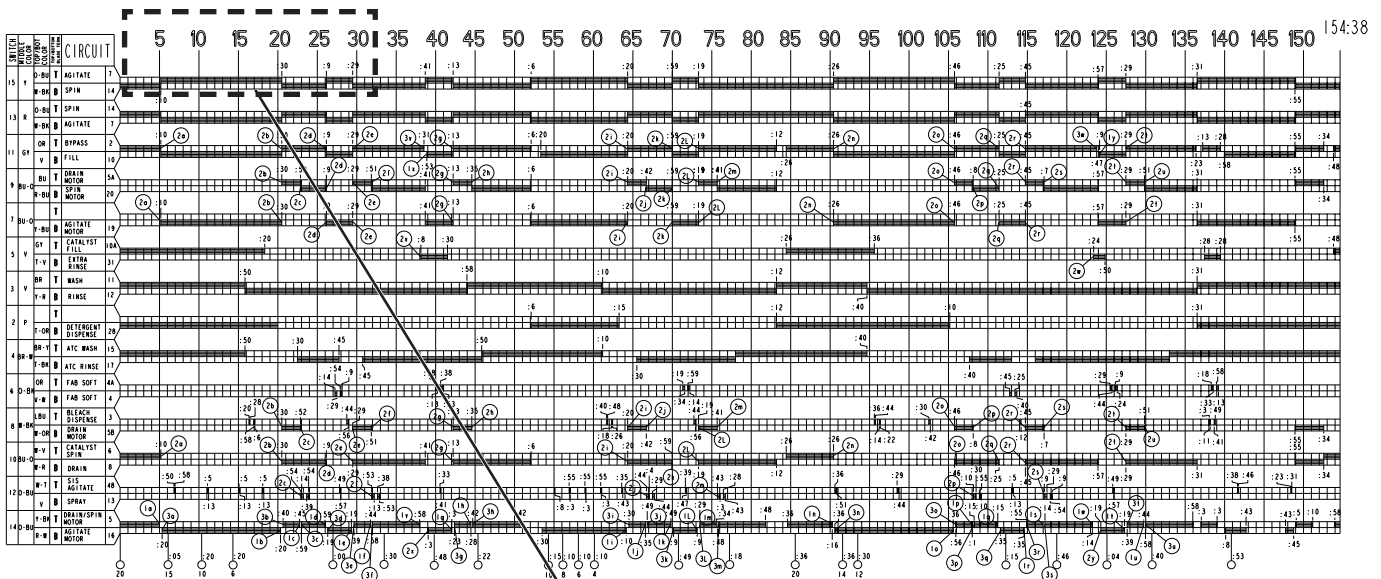
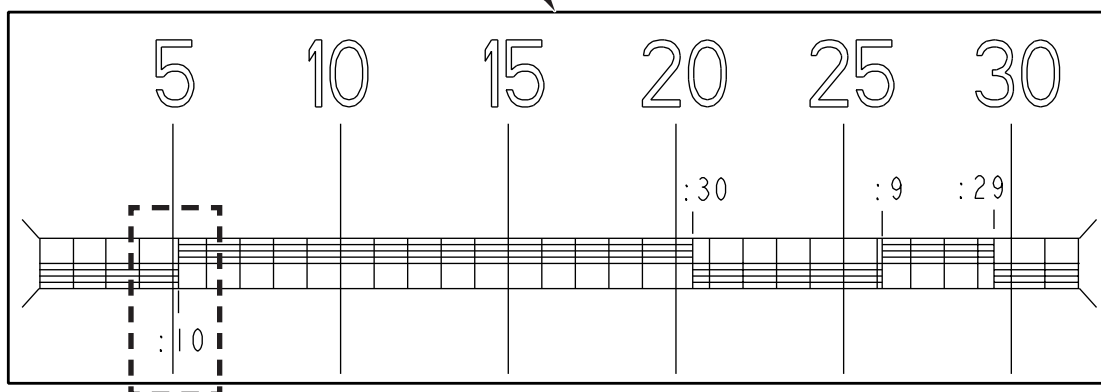
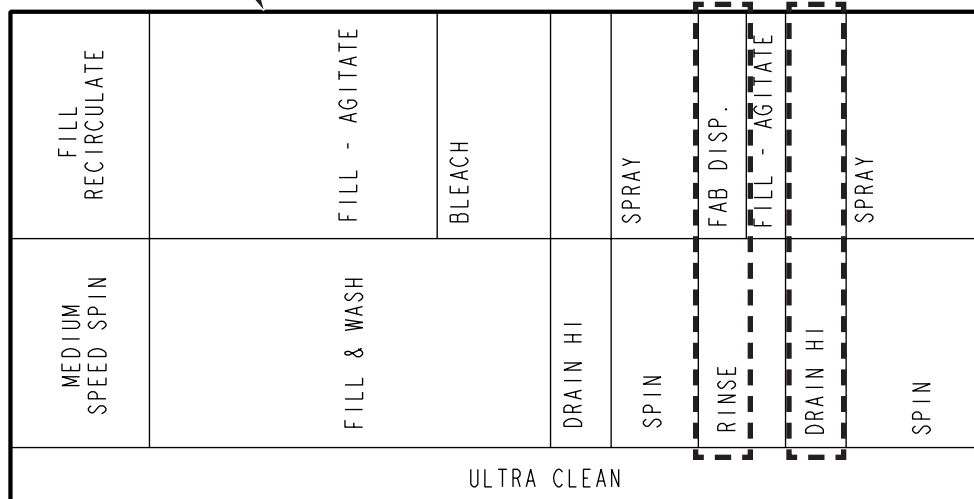
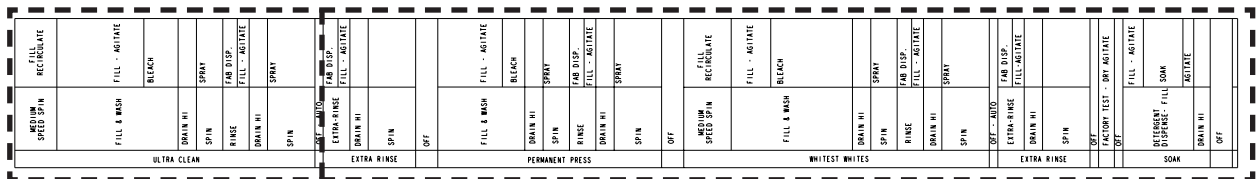
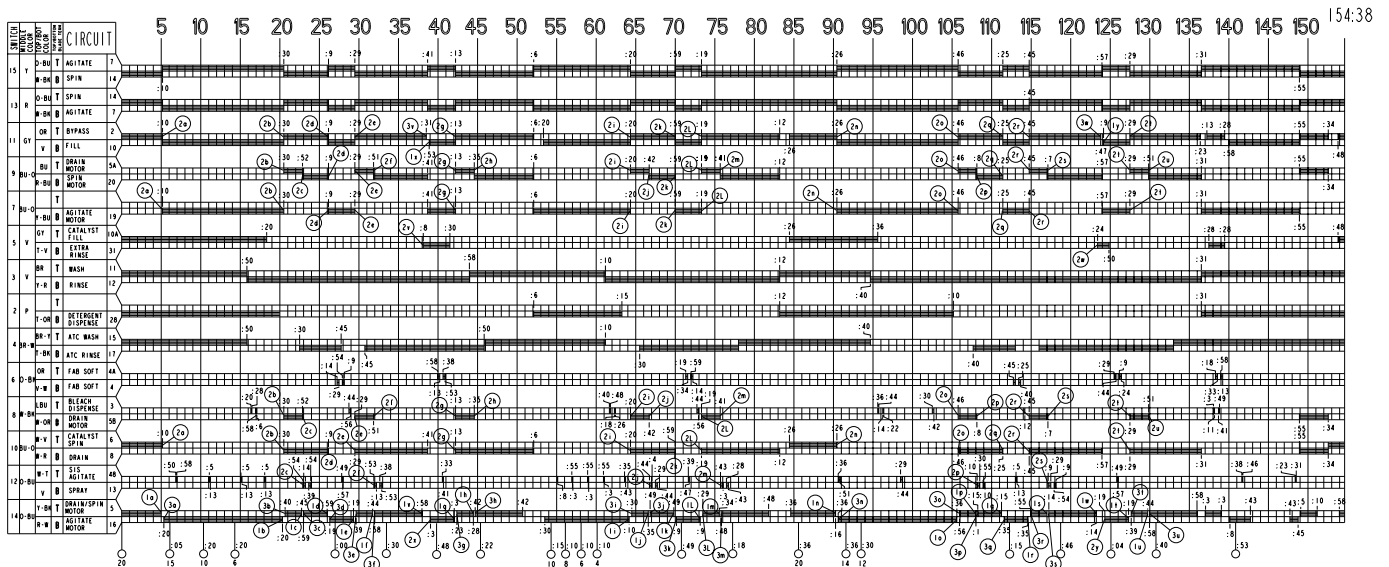
[illegible]

Chart 6

This outlined portion of the chart indicates which **EVENTS** happen during a given time period. Multiple events may also take place over a given time period.

The enlarged chart below shows:

- The “DRAIN HI” is a single event.
- The “FABRIC DISP” event occurs during the “RINSE” event creating a multiple event.



The dial on the timer corresponds to the **CYCLES** on the Esterline chart.

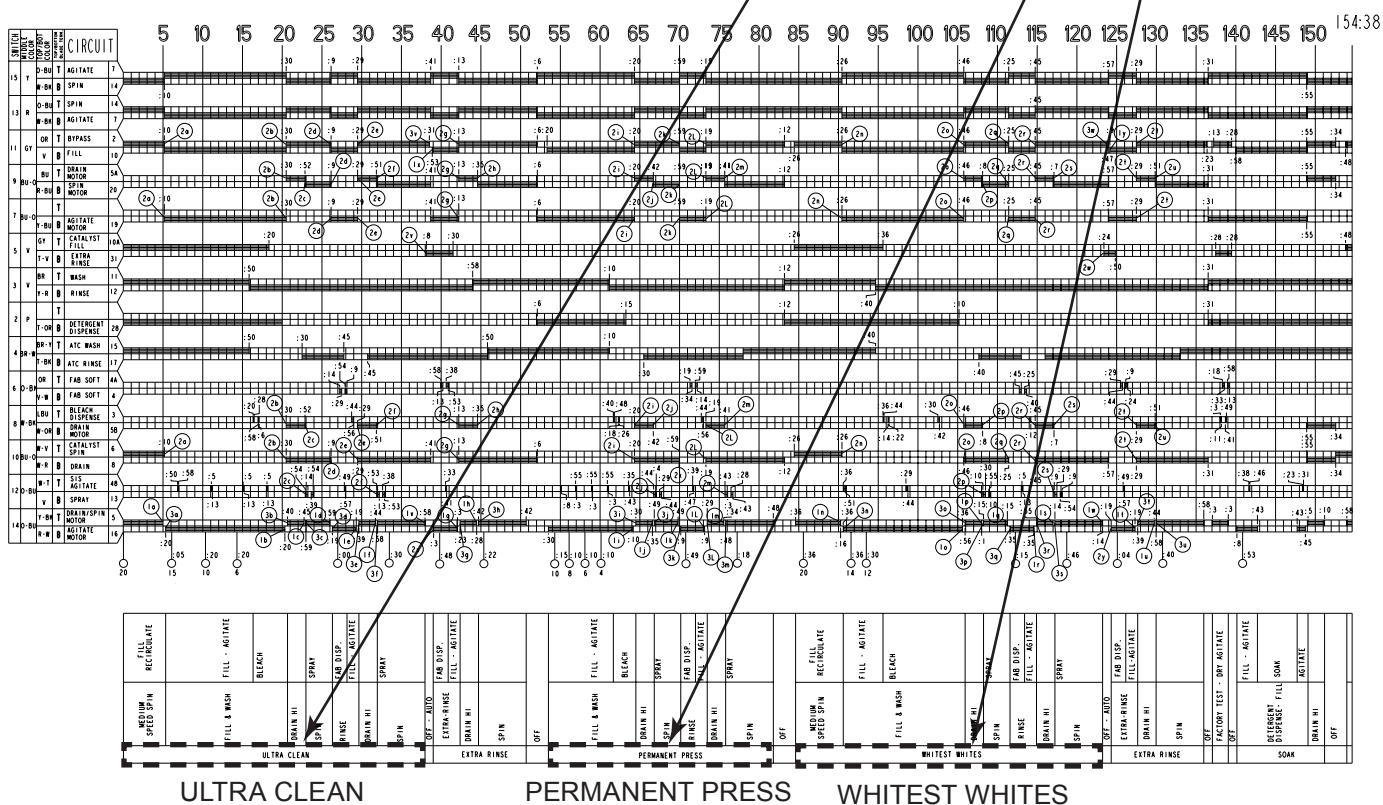


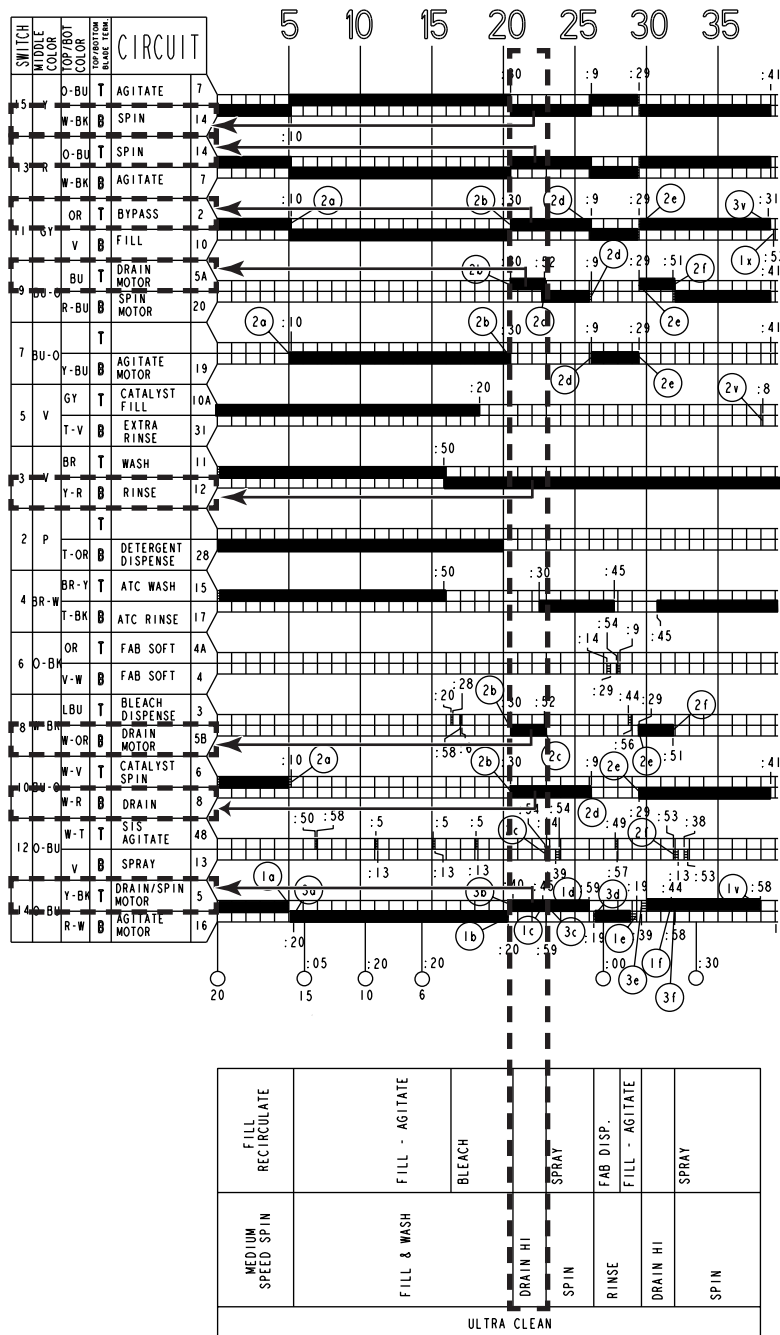
Chart 8

Use the Esterline chart to troubleshoot a specific problem within the machine. If a problem occurs, for example, during the drain cycle, look at the “event” that uses the drain.

Following the drain event, look for which timer contacts are closed (the closed contacts are represented by the black event lines).

Locate the black line in the drain event, and look at the legend. Note that the timer contact number, function, and wire color are shown.

The timer contact numbers will be used to close corresponding switches on the wiring diagram later.

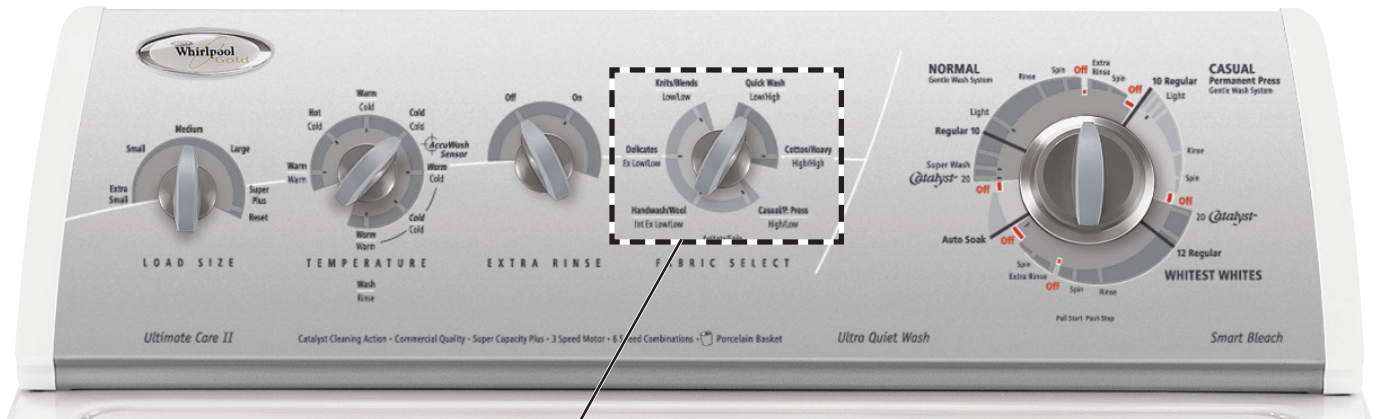


LOGIC CHARTS

Chart 1

Logic charts are used to determine when switch contacts, other than the timer contacts, are closed.

These are normally switches the consumer will select, such as water temperature and motor speed (wash, spin).



CONNEXION INTERNE DE COMPOSANT
CONNEXION INTERNO DEL COMPONENTE
HARNESS WIRING
FAISCEAU DE FILS
CABLEADO DEL HARNESS
HARNESS CONNECTION
CONNEXION DE FILS
CONNEXION DEL HARNESS
● TERMINAL CONNECTION
CONNEXION DE LA BORNE
TERMINAL CONEXION

WASH RINSE / RINCAGE DE LAVAGE
/ ACLARACION DE LA COLADA
DRIVE MOTOR / MOTEUR / IMPULSOR MOTOR
L LOW / LENT / BAJO
M MEDIUM / SUPPORT / MEDIA
H HIGH / HAUT / ALTO
S START / DEMARRENT / EMPIEZAN

H HOT VALVE
SOUPAPE D'EAU CHAUDE
CALIENTE VALVULA

C COLD VALVE
SOUPAPE D'EAU FROIDE
FRIA VALVULA

BL BLEACH
BLANCHIMENT
BLANQUEO

OB OFF BALANCE
DESEQUILIBRE
FUERA DE BALANCE

DRAIN
VIDANGE
DRENAJAE

INTERRUPTEUR DE PRESION DEL RECIRCULATE
FULL / PLEIN / POR COMPLETO

EMPTY / VIDE / VACIO

LID SWITCH
INTERRUPTEUR DU COUVERCLE
INTERRUPTEUR DE LA TAPA

TIMER MOTOR
MOTEUR DE LA MINUTERIE
MOTOR DEL TEMPORIZADOR

CENTRIFUGAL SWITCH
CONTACTEUR CENTRIFUGE
CENTRIFUGO INTERRUPTOR

CABINET GROUND
TERRE DU CHASSI
CABIN MOLIDA

CA CAPACITOR / CONDENSATEUR /
CONDENSADOR

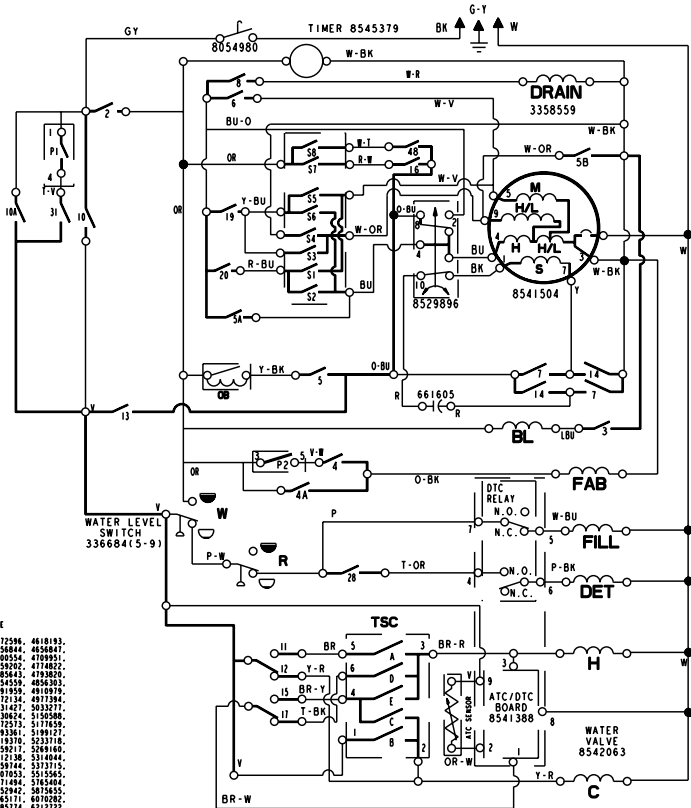
FAB FABRIC SOFTENER
RAMOLLISSANT DE TISSU
SUAVIZADOR DE LA TELA

FILL
REMPLISSEMENT
LLENAR

DET
DETERGENT
DETERGENTE

ATC SENSOR / CAPTEUR D'ATC / SENSOR DEL ATC
ATC BOARD / PANNEAU D'ATC / TARJETA DEL ATC
DTC RELAY / RELAIS DE DTC / RELAIS DEL DTC

TSC TEMPERATURE SWITCH CHART
DIAGRAMME DE COMMUTATEUR DE LA TEMPERATURE
CARTA DE INTERRUPTOR DE LA TEMPERATURA



FABRIC SELECT MOTOR SPEED SWITCH 3954573 COMMUTATEUR DE LA VELOCIDAD DEL MOTOR SELETO DE LA TELA											
FABRIC SELECT DIAL CADRAN CHOISI DE TISSU	MOTOR SPEED VITESSE DE MOTEUR VELOCIDAD DEL MOTOR	SPIN ROTATION VUELTA	CLOSED SWITCHES FERME COMMUTATEUR CERRADO INTERRUPTOR	S1	S2	S3	S4	S5	S6	S7	S8
INT LOW INT BAJA	AGITATE AGITANT	AGITATE AGITANT									
INT MEDIUM INT MEDIA	AGITATE AGITANT	AGITATE AGITANT									
INT HIGH INT ALTA	AGITATE AGITANT	AGITATE AGITANT									
EXTRA DELICATE EXTRA SENSIBLE EXCESO DELICADO	LOW LENT BAJO	MEDIUM SUPPORT MEDIA		X	X						X
DELICATE SENSIBLE DELICADO	MEDIUM SUPPORT MEDIA	MEDIUM SUPPORT MEDIA		X			X	X		X	
REGULAR REGULIER REGULAR	MEDIUM SUPPORT MEDIA	HIGH HAUT ALTO			X		X	X		X	
HEAVY DUTY TRES RESISTANT PESADO	HIGH HAUT ALTO	HIGH HAUT ALTO			X		X		X	X	
HANG DRY ACCROCHER SEC CUELQUE SECO	HIGH HAUT ALTO	MEDIUM SUPPORT MEDIA		X			X		X	X	

MANUFACTURED UNDER ONE OR MORE
OF THE FOLLOWING US PATENTS:
4,545,847; 4,555,519; 4,566,295; 4,572,596; 4,618,193;
4,624,117; 4,633,555; 4,648,455; 4,658,444; 4,664,447;
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8,820,447; 8,825,447; 8,830,447; 8,835,447; 8,840,447;
8,845,447; 8,850,447; 8,855,447; 8

Chart 2

To determine the switches that will be closed, find the selection that has been chosen. The “Regular” and “WC” that are shown below, were selected on the washer console “fabric select” and “water temp” control.

Since a regular Fabric Selection is chosen, follow the “REGULAR” row in the logic chart to a closed switch (designated by an “X”).

Now follow the column with the “X” up, and find the switch that is closed. In this case, the closed switches are S2, S4, S5, and S7.

By doing the same with the other logic switches, the other closed switches A, B, and P2 can also be found.

FABRIC SELECT MOTOR SPEED SWITCH 3954573 COMMUTATEUR DE VITESSE DE MOTEUR CHOISI DE TISSU INTERRUPTOR DE LA VELOCIDAD DEL MOTOR SELECTO DE LA TELA										
FABRIC SELECT DIAL CADRAN CHOISI DE TISSU DIAL SELECTO DE LA TELA	MOTOR SPEED VITESSE DE MOTEUR VELLOCIDAD DEL MOTOR		CLOSED SWITCHES FERME COMMUTATEUR CERRADO INTERRUPTOR							
	AGITATE AGITENT AGITAN	SPIN ROTATION VUELTA	S1	S2	S3	S4	S5	S6	S7	S8
HANDWASH LAVAGE DE MAIN COLADA DE LA MANO	INT LOW INT LENT INT BAJO	MEDIUM SUPPORT MEDIA	X	↑	X					X
EXTRA DELICATE EXTRA SENSIBLE EXCESO DELICADO	LOW LENT BAJO	MEDIUM SUPPORT MEDIA	X		X				X	
DELICATE SENSIBLE DELICADO	MEDIUM SUPPORT MEDIA	MEDIUM SUPPORT MEDIA	X			X	X		X	
REGULAR REGULIER REGULAR	MEDIUM SUPPORT MEDIA	HIGH HAUT ALTO		X		X	X		X	
HEAVY DUTY TRES RESISTANT PESADO	HIGH HAUT ALTO	HIGH HAUT ALTO		X		X		X	X	
HANG DRY ACCROCHER SEC CUELQUE SECO	HIGH HAUT ALTO	MEDIUM SUPPORT MEDIA	X			X		X	X	

OPTION SWITCH CHART 3949180 DIAGRAMME DE COMMUTATEUR D'OPTION CARTA DEL INTERRUPTOR DE LA OPCION		
	P1	P2
ONE RINSE UN RINCAGE UNA ACLARACION		X
EXTRA RINSE RINCAGE DE PLUS ADICIONAL ACLARACION	X	

TSC 3950344		* 65°F±5°F=18°C±2,8°C # 90°F±5°F=32°C±2,8°C				
	WASH RINSE	A	B	C	D	E
1	WW*	X	X		X	
2	HC	X				
3	WC	X	X			
4	CC		X			
5	#WC	X		X		
6	*CC		X			X
7	#WW*	X		X	X	

TRACING DIAGRAMS

Diagram 1

Since the closed switches and timer contacts for a particular time are now known, this knowledge can be applied to the wiring diagram.

First, close all the switches that are marked on the logic and Esterline charts. This will give a “moment in time” view of the active circuits. Also move the water level switches if the “moment in time” is happening when the tub is full of water.

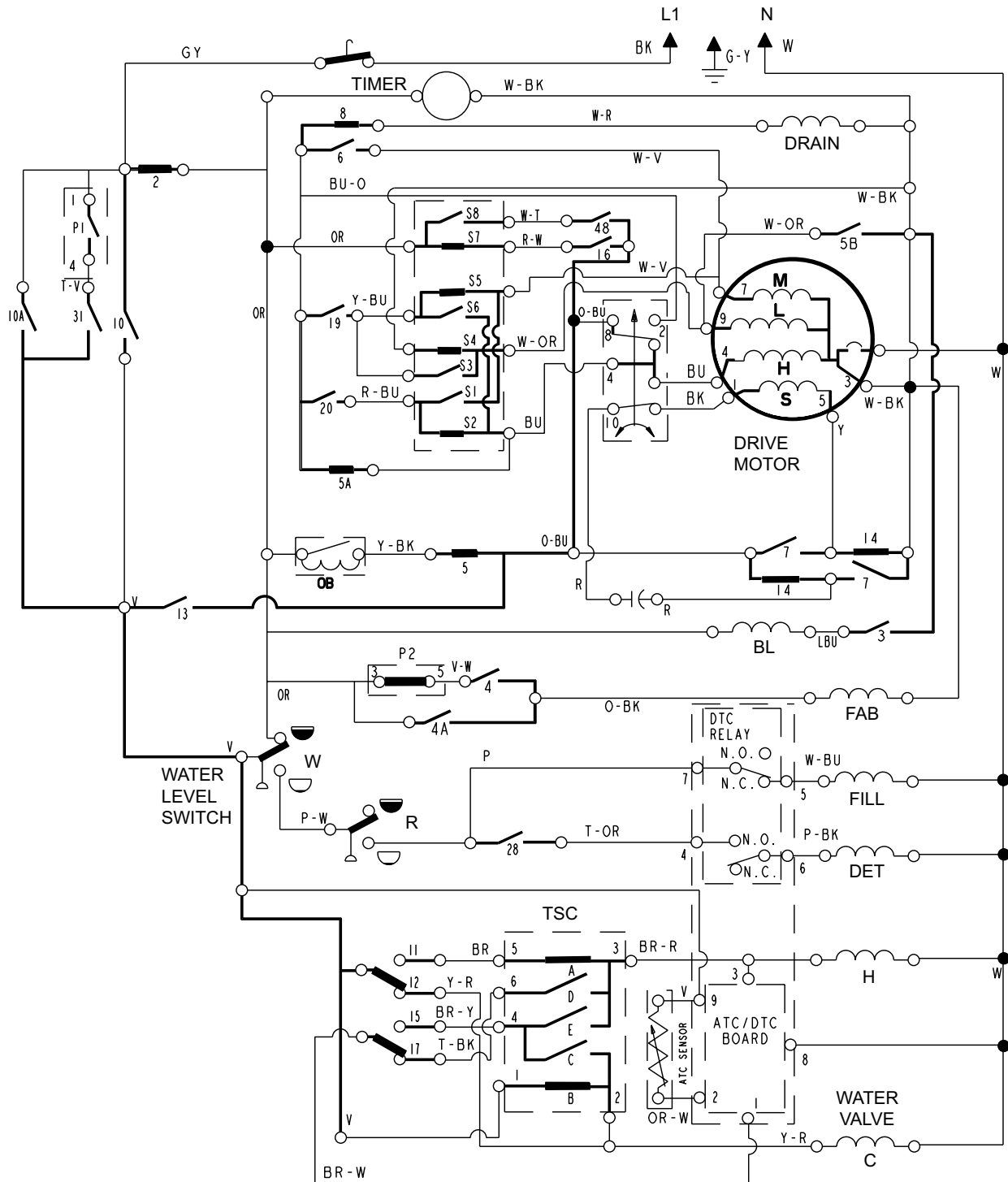


Diagram 2

With all the switches closed on the wiring diagram, now trace the active motor circuits at startup.

Active circuits are always traced from source (L1) to source (N).

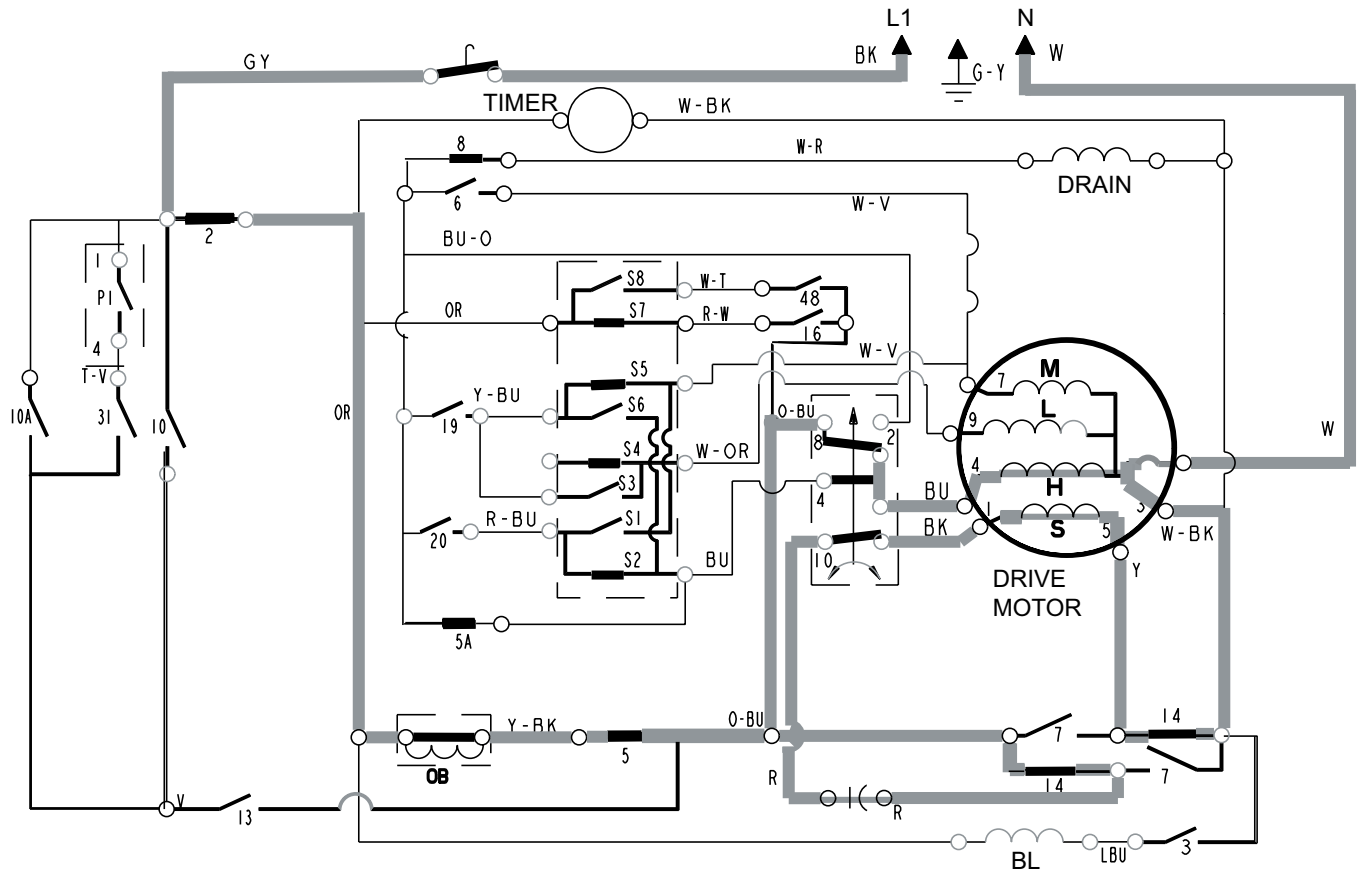
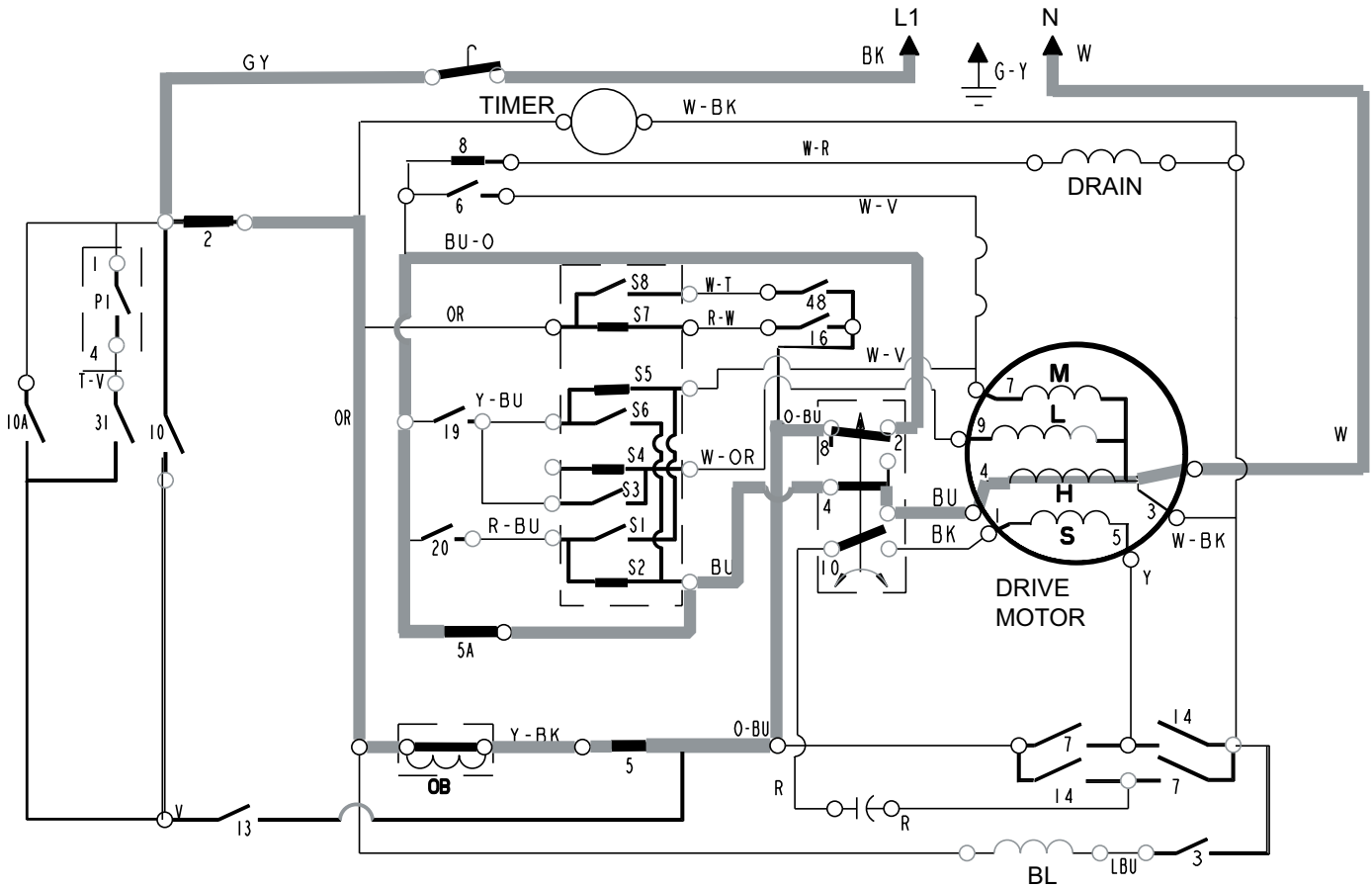


Diagram 3

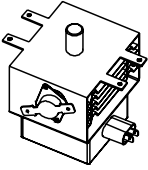
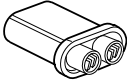
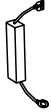
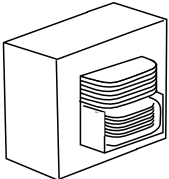
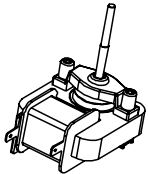
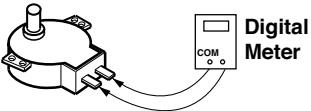
This is the active circuit of the drive motor at full speed.



COMPONENT TESTING

Many tech sheets will have sections describing in detail how to test individual components.

The examples below show how to test the components in a microwave oven.

Components	Test	Results
Magnetron 	1. Unplug microwave oven or disconnect power. 2. Remove wire leads. Check that the seal is in good condition. 3. Measure resistance (ohmmeter scale: Rx1): 4. Measure resistance (ohmmeter scale: Rx1k):	Filament terminal ■ Normal: Less than 1 ohm Filament to chassis ■ Normal: Infinite
H.V. Capacitor 	1. Unplug microwave oven or disconnect power. 2. Discharge capacitor. 3. Remove wire leads. 4. Measure resistance (ohmmeter scale: Rx1k):	Terminal to terminal ■ Normal: Momentarily indicates several ohms, gradually returns to Infinite Terminal to case ■ Normal: Infinite
H.V. Diode Some inexpensive meters may indicate infinite resistance in both directions. 	1. Unplug microwave oven or disconnect power. 2. Measure continuity (ohmmeter scale: Rx1k): 3. Measure continuity (ohmmeter scale: Rx1k):	Forward ■ Normal: Continuity Abnormal: Infinite Reverse ■ Normal: Infinite Abnormal: Continuity
L.V. Light Transformer 	1. Unplug microwave oven or disconnect power. 2. Remove wire leads. 3. Measure resistance (ohmmeter scale: Rx1):	Primary winding ■ 45 ohms (approximate) Secondary winding ■ 0.6 ohm (approximate)
Cooling Fan Motor 	1. Unplug microwave oven or disconnect power. 2. Remove wire leads. 3. Measure resistance (ohmmeter scale: Rx1):	Normal: 10 ohms (approximate) Abnormal: Infinite
Turntable Motor/Stirrer Motor 	1. Unplug microwave oven or disconnect power. 2. Remove wire leads. 3. Measure resistance (ohmmeter scale: Rx1k):	Turntable Motor ■ Normal: 2,450 ohms (approximate) ■ Abnormal: Infinite Stirrer Motor ■ Normal: 3.3k-4.2k ohms (approximate) ■ Abnormal: Infinite

ELECTRONIC CONTROLS

Esterline charts are only for electro-mechanical timers, not electronic controls. There is no easy way to create a timing chart for an electronic controlled unit.

In order to properly troubleshoot either type of unit, the technician will need to:

- Use the tech sheet
- Understand the machine's operation
- Know the user's input to the machine
- Properly use the diagnostics cycle
- Understand and use strip circuits

The technician will need to determine whether the problem is:

- Mechanical
- Electrical
- Consumer-related

To troubleshoot electronic controls, it is often necessary to rule out everything else in the circuit before replacing the control.

Future innovations are the standardization of the electronic controls. The diagnostics mode will be accessed the same no matter what appliance you are servicing.

SAMPLE EXERCISE

EXAMPLE

A dishwasher's detergent dispenser door is not opening properly. Use the diagnostics mode to test the dispenser circuit.

The first step will be to enter the diagnostics cycle by following the tech sheet instructions.

USING THE SERVICE DIAGNOSTICS CYCLE CHART

To start the Service Diagnostics Cycle, press the following keys, in order, in less than 6 seconds, while in standby: Heated Dry, Normal, Heated Dry, Normal.

To rapid advance one interval at a time, press the Start key, noting that unlike standard cycles, the diagnostics cycle automatically resumes after door openings, and does not require pressing Start to resume.

Continued on the next page.

SERVICE DIAGNOSTICS CYCLE

Understanding of the diagnostics cycle chart is very important. The timing for when the loads are energized and for how long are especially important.

Note that the lights will toggle to help aid the technician in determining what part of the diagnostics cycle the machine is in. It will also show when the load is active.

Find the dark area in the dispenser row, and follow column up to determine the timing length and interval.

The interval at the top of the chart shows when to expect the dispenser load to be activated.

The interval time will show how long the load will be energized.

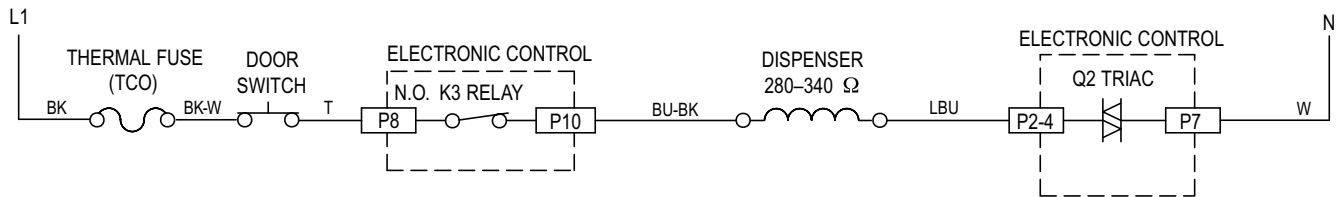
If the load (dispenser) does not open during the proper time in diagnostics, proceed to the strip circuit.

INTERVAL	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
CYCLE LED's																				
POTS & PANS																				S A
NORMAL																				T T
SMART WASH																				A T
CHINA																				N E
FAST WASH																				D N
RINSE ONLY																				B T
CANCEL DRAIN																				Y E
OPTION LED's																				
HI TEMP OPTION																				
TURBO WASH OPTION																				
SOAK OPTION																				
DRY OPTION																				
SANI RINSE OPTION																				
DELAY - 2 HR																				
DELAY - 4 HR																				
DELAY - 6 HR																				
DELAY																				
CYCLE PROG/STATUS LED's																				
START/RESUME																				
LOCKOUT																				
WASHING																				S A
CIRC																				T T
RINSING																				A T
DRYING																				N E
RUNNING																				D N
SOAKING/SENSING																				B T
ADD-A-DISH																				Y E
SANITIZED																				
CLEAN																				
NUMERIC DISPLAY NOTES [2, 3] (software identification in intervals 17 and 18, see Note 3)	88	d1	10	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
INTERVAL TIME (min:sec) TOTAL TIME: 16:15	0:06	0:02	0:02	0:02	0:03	0:03	0:06	0:45	2:00	0:15	3:00	0:15	2:00	2:00	2:00	1:00	1:00	1:00	3:00	
SOIL SENSOR CHECKS																				
SOIL SENSING / APF ENABLED INTERVALS (Max # of APF Purges allowed shown) (Min. of 60 sec. between purges)																				
VERIFY PRESSURE SWITCH IS WORKING/PRESENT SHOULD CLOSE DURING START OF DRAIN																				
LOADS																				
VENT																				S A
FILL (APF purges are allowed in APF Enabled Intervals. APF Purge = 5 sec. Fill & Drain, then 5 sec. Fill)																				T T
WASH MOTOR																				A T
DETERGENT / RINSE AID DISPENSER																				N E
TURBO WASH WAX MOTOR																				D N
DRAIN MOTOR (APF purges are allowed in APF Enabled Intervals; APF Purge = 5 sec. Fill & Drain, then 5 sec. Fill)																				B T
HEATER																				Y E
	2	3	3								4	5	5							
	NOTES																			

It is necessary to eliminate all loads and switches before replacing electronic controls. Utilizing strip circuits, such as the one shown below, helps to identify and test the individual loads and switches that are involved with the dispenser circuit. The strip circuit helps to eliminate guesswork during circuit tracing.

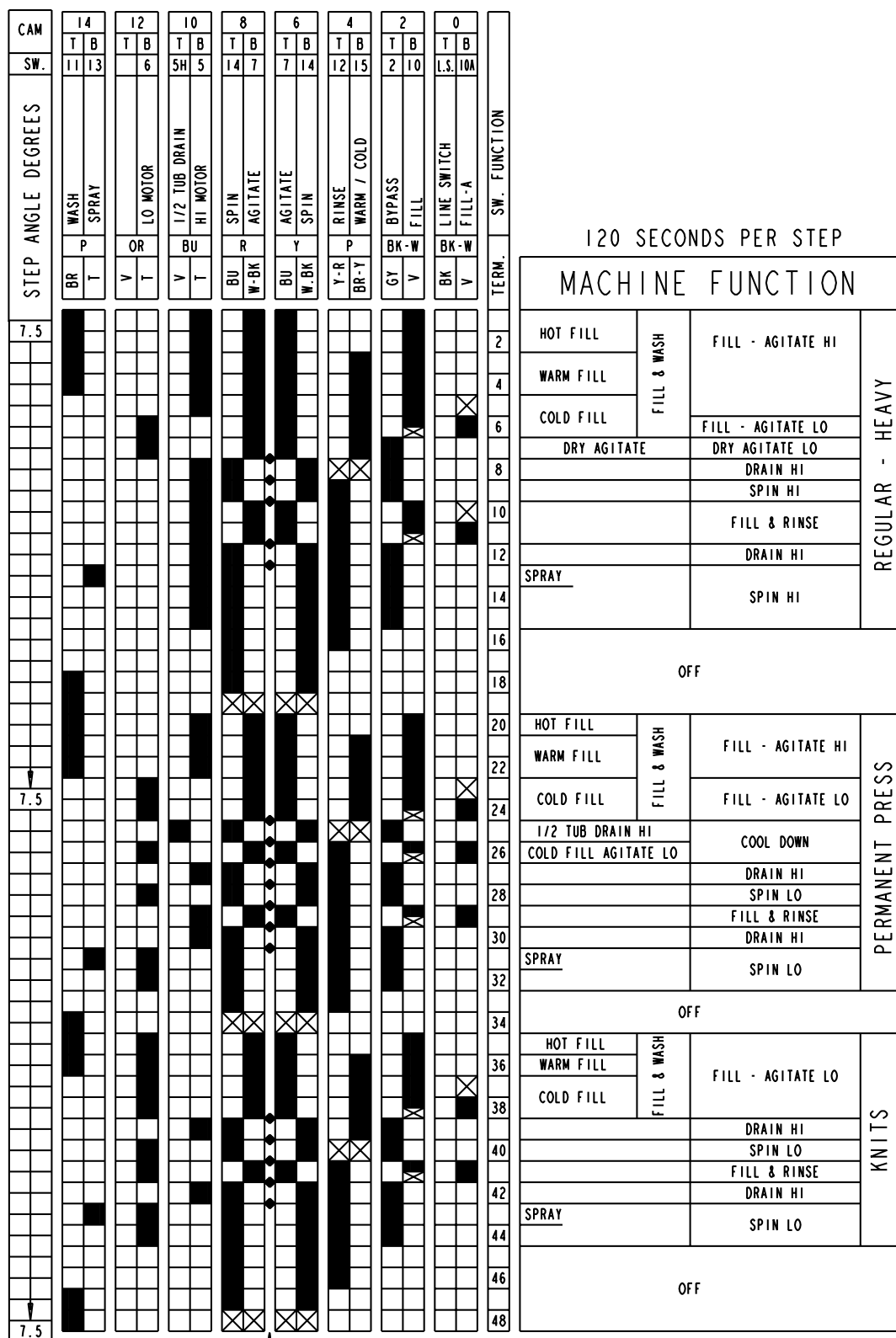
Replace the electronic control only when necessary. The key to locating the trouble is to follow the instructions shown on the tech sheet, and to use the information to help solve the problem.

DISPENSER (DETERGENT & RINSE AID)



Exercise 1

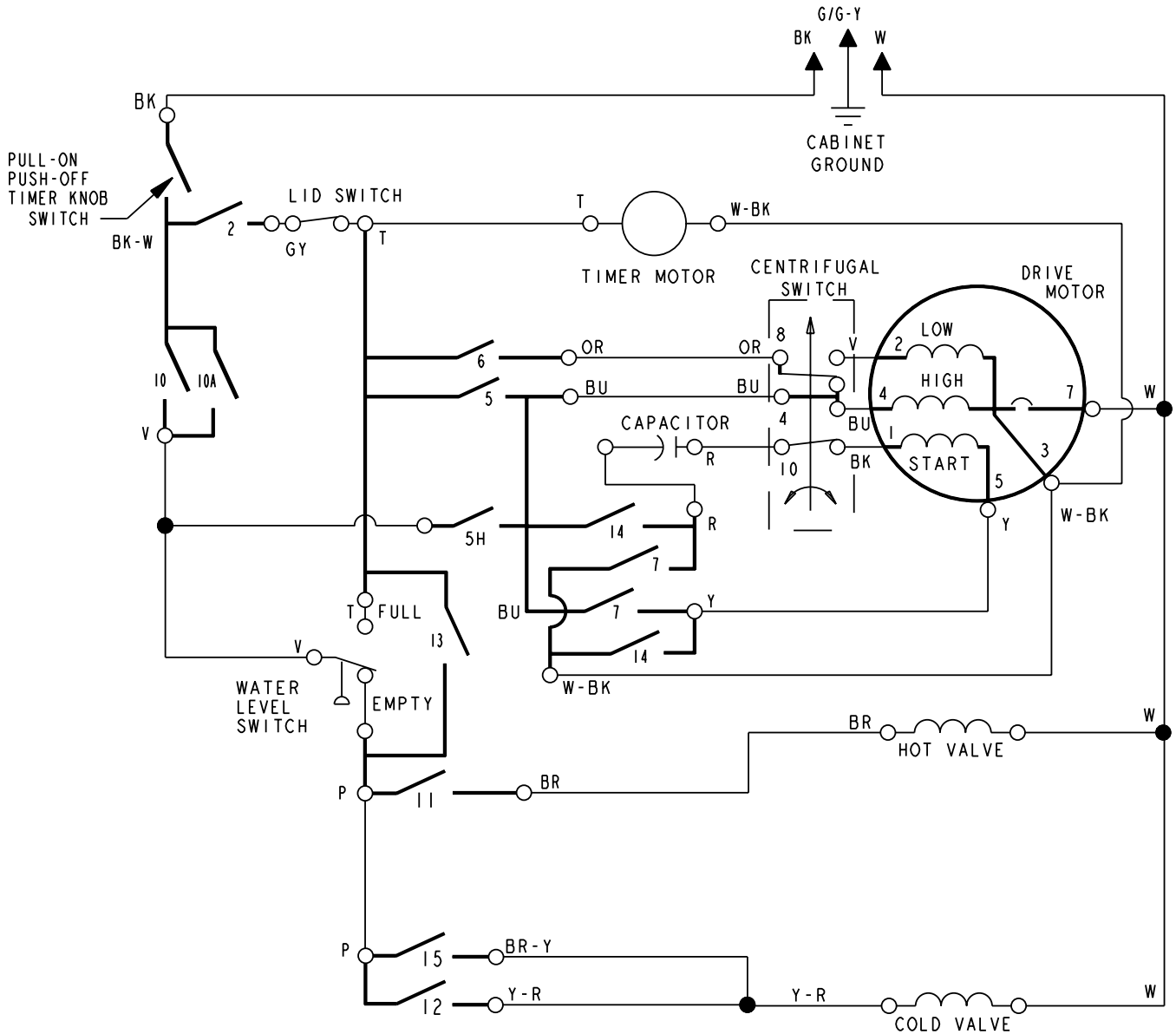
Find the timer contacts that will be closed during the “Knits, Hot Fill” cycle. The tub is empty.



◆ INDICATES MOTOR "OFF"

Exercise 2

Close the proper switches and trace the active circuits.

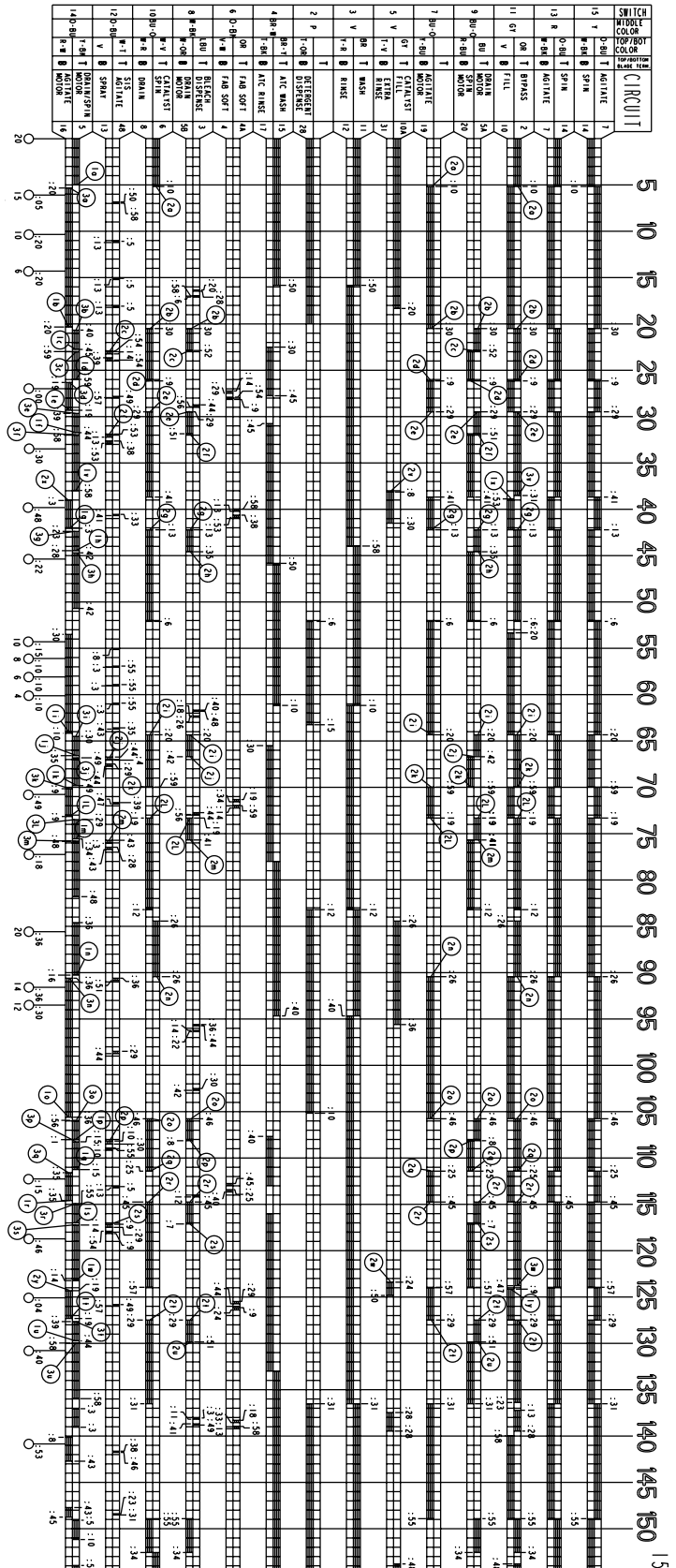
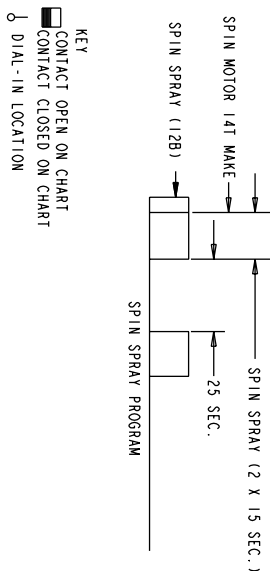


Exercise 3

Find the closed contacts during the Permanent Press agitate event.

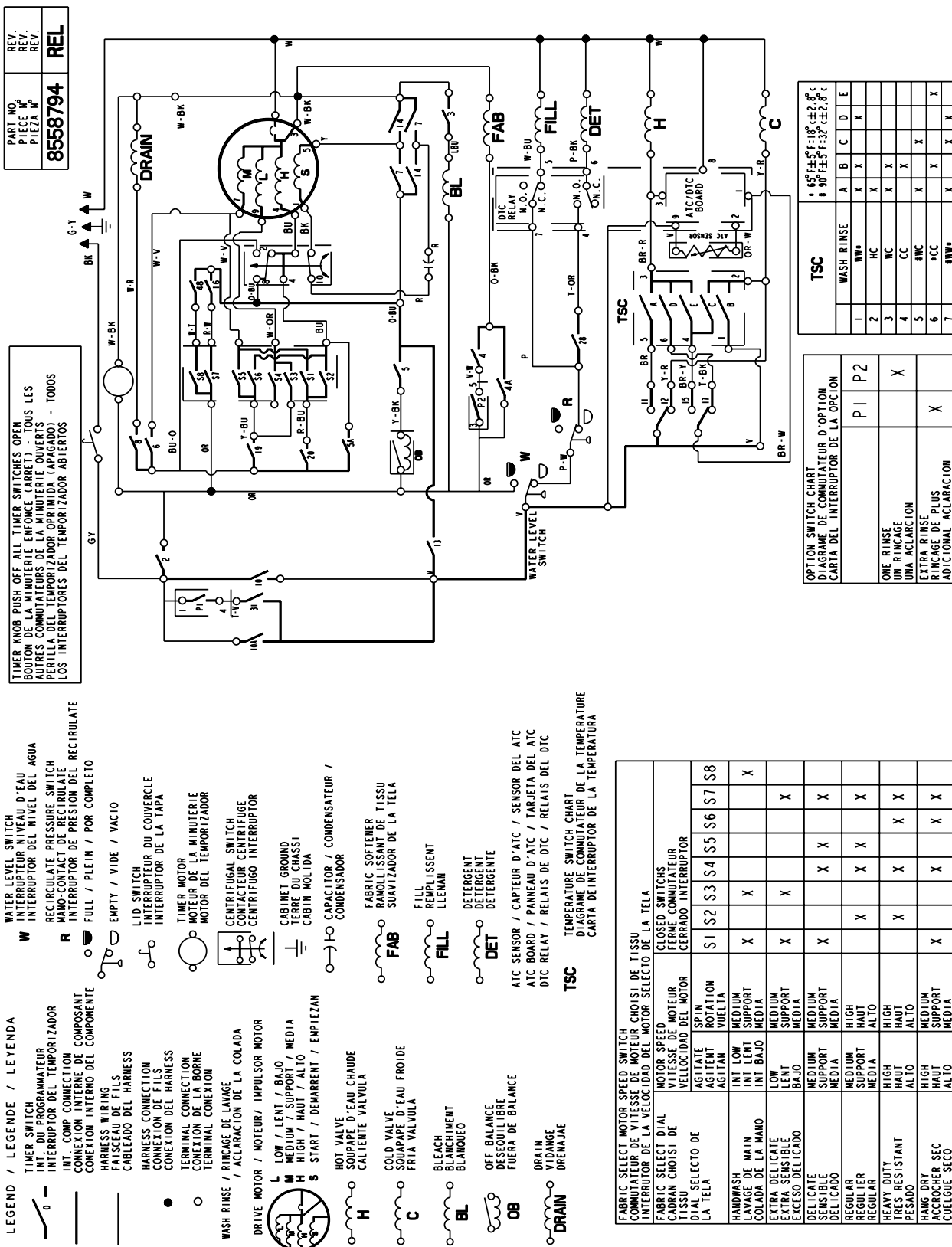
[illegible]

ENGLISH	FRENCH	SPANISH
RINSE	RINCE	ACARICCIÓN
SOAK	IMBIBIR	REMOLAN
SPLIN	ESSORAGE	VUELTA
SPRAY	CICLEGE	AEROSOL
WASH	LAVAGE	COLADA
TIME FILL	SINKRONIZATS REMPLISSAGE	SINKRONIZADO TERAPIELES
1/2 HD DRAIN	1/2 COUETTE VID	DREI DE LA TINA DEL 1/2
FAB. SOTNER	RAMOLLISSANT DE TISSU	SUAVIZADOR DE LA TELA
DETERGENT	DETERGENT	DETERGENTE
OOF	ARET	DE
COOL DOWN	REFROIDISSEZ	REFRESCASE ABIAJO
DRI AGITATE	SECHEZ AGITER	SECO AGITAN
ULTRA CLEAN	ULTRA PROPRE	ULTRA LIMPIO
EXPRESS WASH	E'XPRESS SE LAVAE	EXPRESSE EL LAMDO
ACTORIN TEST	EXAMIN D'USINE	LA PRUEBA DE LA FABRICA



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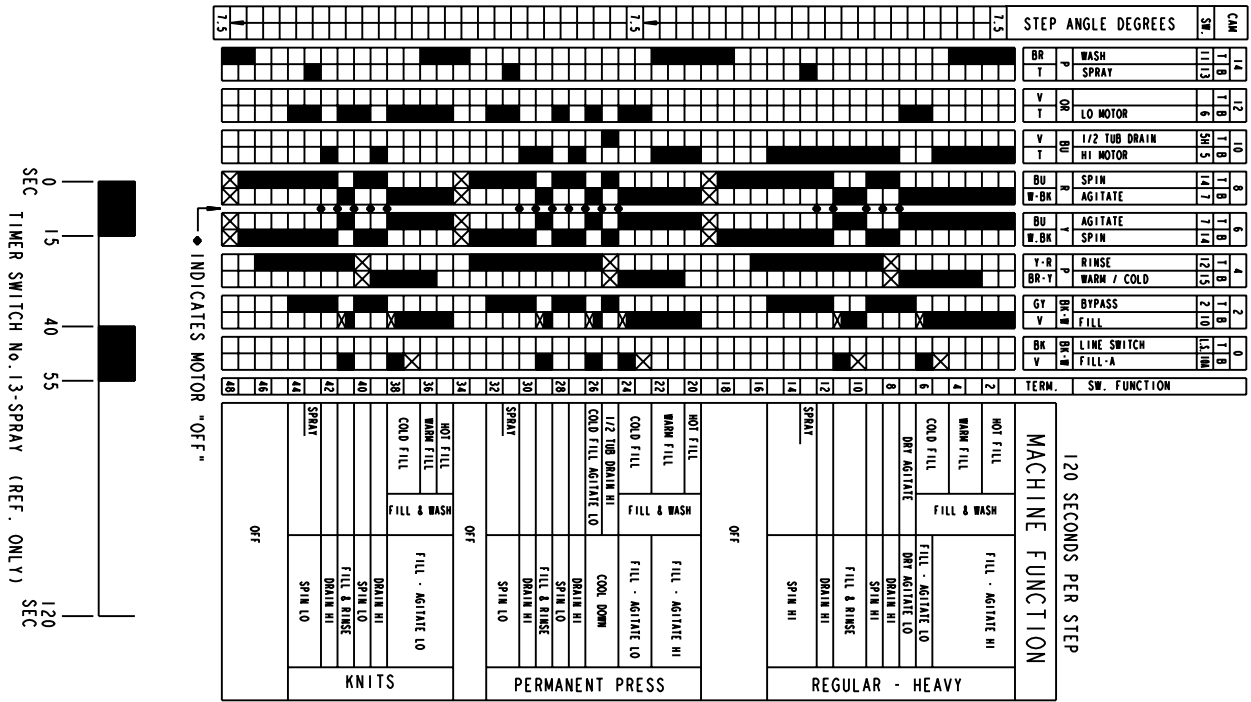
LEGEND / LEGENDE / LEYENDA



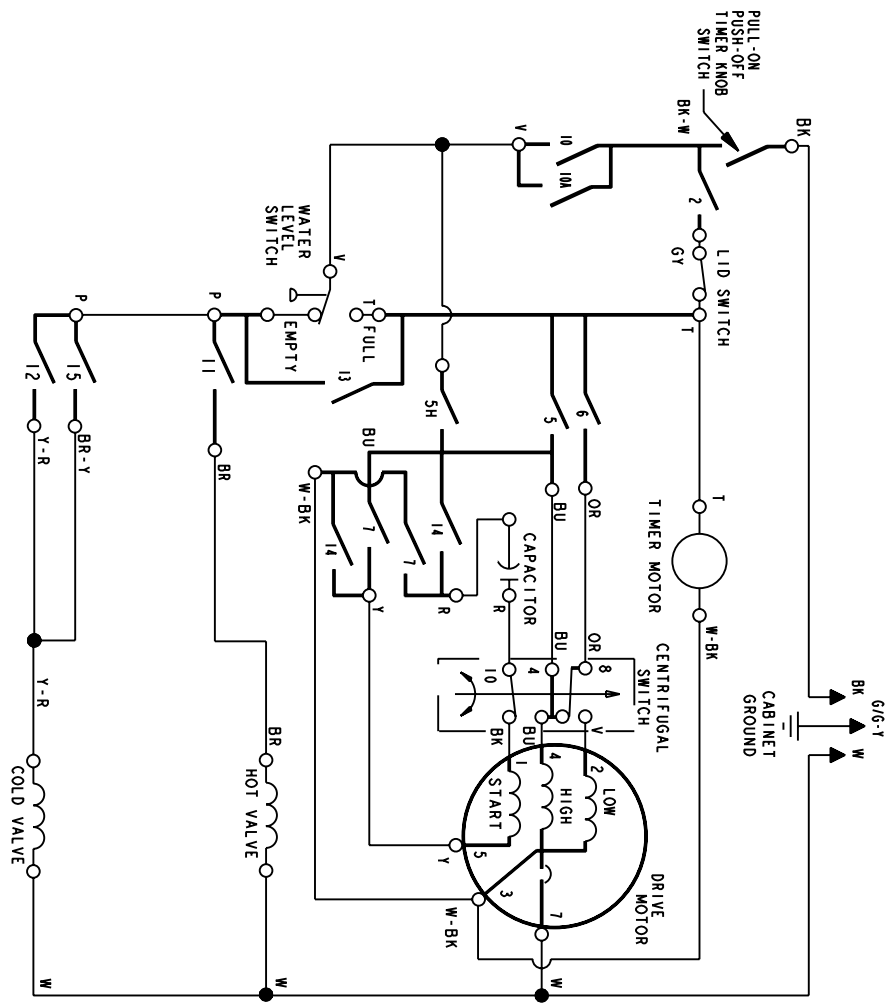
TSC		WASH RINSE		A	B	C	D	E
1	WW*	X	X	X				
2	HC	X						
3	WC	X	X					
4	CC		X					
5	*WC	X	X					
6	*CC		X					
7	WW*	X		X	X	X	X	X

OPTION SWITCH CHART DIAGRAMME DE COMMANDEUR D'OPTION CARTE DEL INTERRUPTOR DE LA OPCION	
	P1 P2
ONE RINSE UN RINÇAGE UNA ACLARACION	X
EXTRA RINSE RINÇAGE DE PLUS ADICIONAL ACLARACION	X

ADDITIONAL DIAGRAM/CHART



PART NO.	REV
NUMERO DE PIECE	REVISION
NUMERO DE PIEZA	REVISION
3954706	A



- LEGEND
- 0 — TIMER SWITCH
 - 13 — SUB-INTERVAL SWITCH
 - INT. COMP CONNECTION
 - HARNESS WIRING
 - HARNESS CONNECTION
 - TERMINAL CONNECTION
 - X TIMER SWITCH MAY BE OPEN OR CLOSED

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FOR KITCHENAID PRODUCTS: 1-800-422-1230

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